DOCUMENT RESUME

ED 137 752 CS 003 366

AUTHOR	Ortony, Andrew; And Others
TITLE	Metaphor: Theoretical and Empirical Research. Technical Report No. 27.
INSTITUTION	Bolt, Beranek and Newman, Inc., Cambridge, Mass.; Illinois Univ., Urbana. Center for the Study of Reading.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
PUB DATE	Mar 77
CONTRACT	400-76-0116
GRANT	HEW-NIE-G-74-0007
NOTE	63p.
EDRS PRICE	MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS	*Comprehension; Context Clues; Developmental Stages; Elementary Secondary Education; *Language Development; *Literature Reviews; *Metaphors; Proverbs; *Reading Research; Research Design; Validity
IDENTIFIERS	*Center for the Study of Reading (Illinois)

ABSTRACT

In this document, a review of traditional definitions and theories of metaphor suggests that they err in equating metaphors with comparisons rather than merely implying comparisons. Empirical research is then reviewed, revealing serious problems, particularly in developmental research. These problems include inadequate theories about the nature of metaphor, inadequate control over preexisting knowledge, and hasty conclusions that children cannot understand metaphors, drawn because in certain experimental conditions children do not select metaphorical interpretations. Related research on the comprehension of proverbs and analogies is discussed and recommendations for future research are made. These depend on a redefinition of metaphor and on adequate controls of preexisting knowledge, surface structure, and meaning. The approach suggested emphasizes the context-dependent nature of metaphors. Finally, it is argued that, even if metaphors can be transformed into comparisons, these comparisons are themselves nonliteral and, consequently, still need to be explained. (Author/AA)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CS201702

CENTER FOR THE STUDY OF READING*

Technical Report No. 27

METAPHOR: THEORETICAL AND EMPIRICAL RESEARCH

Andrew Ortony and Ralph E. Reynolds
University of Illinois at Urbana-Champaign

Judith A. Arter
Phoenix Union High School System

March 1977

University of Illinois
at Urbana-Champaign
1005 West Nevada Street
Urbana, Illinois 61801

Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

This work was supported in part by a Spencer Fellowship awarded to the first author by the National Academy of Education, and in part by the National Institute of Education under Grant No. HEW-NIE-G-74-0007 and Contract No. MS-NIE-C-400-76-0116.

CS 023 366

*Designation as a Center pending approval.

Abstract

Metaphor plays a major role in our understanding of language and of the world we use language to talk about. Consequently, theories of language comprehension and of language itself are incomplete if they do not handle metaphor, and they are inadequate if they cannot. Traditional definitions and theories of metaphor are reviewed. It is suggested that they err in equating metaphors with comparisons rather than merely implicating comparisons. Empirical research is then reviewed, revealing, for the most part, serious problems, particularly in the developmental research. These problems often relate to inadequate underlying theories as to the nature of metaphor. Other difficulties include inadequate controls over pre-existing knowledge, and over-hasty conclusions that children cannot understand metaphors because in certain experimental conditions they do not select metaphorical interpretations. Related research on the comprehension of proverbs and analogies is discussed. Some recommendations for future research are made. These depend on a re-definition of metaphor and the case of an investigative approach which will permit adequate controls of pre-existing knowledge, surface-structure, and meaning. The approach emphasizes the context-dependent nature of metaphors, and takes advantage of it. Finally, the role of comparisons is revisited. It is of no avail to argue that metaphors are really implicit comparisons if, in so doing, it is hoped to account for, or explain, their non-literal nature. For, even if metaphors can be transformed into comparisons, these comparisons are themselves non-literal, and consequently still need to be explained.

Introduction

In the simplest and most obvious case of language comprehension, a reader or listener understands what he reads or hears in terms of a literal interpretation of what is written or said. Not surprisingly, therefore, the bulk of research in the psychology of language comprehension has concerned itself with the comprehension of literal uses of language. However, in both written and oral language it very often happens that the speaker or writer does not intend what he says to be taken literally, often if it is it either makes no sense at all with respect to the surrounding context, or it appears to express something that is either impossible or false. It is our thesis that if research into the comprehension of natural language is to have ecological validity, it is necessary that we go beyond the more traditional research tract, and extend our investigations to nonliteral uses of language, which together with literal language, constitute the whole range of linguistic communication.

One class of nonliteral uses of language that has recently started to receive attention from psychologists is called "indirect speech acts." This class will not concern us (but, see, for example, Clark & Lucy, 1975; Schweller, Brewer, & Dahl, 1976). Rather, we shall be concerned with metaphor and related figurative uses of language such as similes, and, to some extent, analogies. Throughout our review we use the term "metaphor" somewhat loosely; sometimes we use it narrowly to refer to specific utterances which are or contain metaphors in the usual sense of the word; sometimes we use it more broadly to refer to related nonliteral uses of language such as similes or analogies.

Extant theory and research concerning the development of the production and comprehension of metaphor yields numerous opinions and contradictory findings. For example, one group of studies (characterized by the work of Gardner, 1974; and Pollio & Pollio, 1974) suggests that even young children (age 5 or younger) are capable of using and understanding figurative language. Other research (Schaffer, 1930; Asch & Nerlove, 1960) however, suggests that these capacities do not emerge until the child reasches adolescence. This kind of inconsistency is, of course, not unusual in developmental research.

Implicit in our review is the suggestion that one of the reasons for the non-uniformity of research findings is that research seems not to have been grounded in an adequate understanding of what metaphor is. This is no criticism of the theorists whose work we review; rather it seems to be endemic in the history of thought about the problem. Metaphors may be easy to recognize, but they are difficult to define. It is not easy to give a psychological analysis of an ill-understood notion. This lack of understanding, however, is not widely acknowledged, and entrenched beliefs about metaphor are ubiquitous. Among these are such dubious claims as: Metaphors <u>are</u> comparisons; metaphors <u>are</u> (must be) semantic anomalies; and the folklore of classrooms and editors--metaphors, like drinks, should never be mixed. As this review proceeds, we hope to show that the first two are false claims, but we will digress here to discuss the mixing of metaphors. First, let it be said that to our knowledge there is no theory of metaphor, or language comprehension, or probably even of literary style that has the dictum "don't mix metaphors" as a consequence. Indeed, the dictum is probably as groundless

as many others in the educational folklore of English teaching. Why should one not split infinitives? Why should one use "that" rather than "which?" And, as Winston Churchill once objected, why should one not end sentences with prepositions? Churchill's objection was voiced in the House of Commons when he finished a sentence with the phrase ". . . up with which I will not put." to demonstrate the absurdity of the dictum. Mixed metaphors, far from being heinous, can be very powerful and often rather amusing. In the recent campaign for the Republican party presidential nomination Ronald Regan probably expressed his intentions very vividly when he complained that the ship of state was sailing the wrong way down a one way street!

In a recent review of metaphor and psychological theory, Billow (1976) cites some of the studies that we do. However, we find Billow's review rather unsatisfactory. First, it ranges far and wide over psychology. For example, at one extreme it uncritically cites an unsupported Freudian interpretation of "I've wandered off the point and can't find it again" (Sharpe, 1968), in terms of a subconscious reference to failed childhood attempts to reach the mother's nipple. At the other extreme, it discusses fairly standard developmental literature without adequately reviewing its strengths and weaknesses. But more important, while acknowledging the confused state of the art by noting that "theory is incomplete and research is non-conclusive," little attempt is made to identify the root causes of this state of affairs and the review contributes little towards remedying them. The present review attempts to focus more on a cognitive approach and outlines some positive proposals. For although philosophers have been interested in the nature of metaphor at least since the time of Aristotle, there seems to have been relatively little progress since that

time. It is our contention that a prime reason for this is the relative inexactness and inadequacy of the dominant philosophical theories and definitions of metaphor. A good definition is needed not, as Richards (1936) claimed "... to protect our natural skill from the interference of unnecessarily crude views," but rather to explicate that natural skill.

Metaphor: Traditional Definitions and Theories

For a long time, metaphors were considered to be merely the direct substitution of a nonliteral phrase for a literal phrase which had exactly the same meaning. Black (1962), in discussing this view, presents two reasons why authors would desire to replace a straightforward statement of what is meant with a nonprecise phrase, the meaning of which must be deduced. The first reason was stylistic. Metaphors presumably decorate writing. In addition, the reader was supposed to feel delight at the discovery of the hidden meaning. Secondly, metaphors were seen as useful in "coining" terms for new concepts, such as "leg" of a triangle (Breal, 1964). The substitution view allowed metaphor only a minor role in language. In fact, it led directly to the conclusion that the use of metaphor was an affectation which only obscured literal meaning. A modern example of such an opinion can be found in Millar (1976) who maintains that, "metaphors are often used in a misleading way to play upon the emotions or to carry an argument by means of distortion and overemphasis." Other approaches, however, have allowed metaphor to play a more important role in language functioning and development.

In our discussion, we will, wherever possible employ the terminology developed by Richards (1936). This terminology is both useful and quite

widely accepted. Richards argued that metaphors consist of two terms and the relationship between them. The subject term he called the "topic" or "tenor," the term being used metaphorically the "vehicle," and the relationship, or that which the two have in common he called the "ground." For example, in the metaphor "The question of federal aid to parochial schools is a bramble bush" (cited by Barlow, Kerlin, & Pollio, 1971), the topic is "federal aid to parochial schools," the vehicle is "bramble bush," and the ground is the idea of impenetrable complication. Richards further introduced the notion of "tension" to denote the literal incompatibility of the topic and the vehicle. In the example above, the metaphorical tension arises from the literal incompatibility of federal aid and bramble bushes. The identification of these various components of metaphor is not always as straightforward as in the example just given, but as an analytical tool Richard's terminology is often useful.

The comparison theory of metaphor. From antiquity to the present the most widespread view of the nature of metaphor is that it is essentially a comparison between or juxtaposition of objects which are literally disparate (Barlow et al., 1971; Perrine, 1971). The exact nature of the comparison, and the resulting implications concerning the use and comprehension of metaphor, varies from author to author. Some argue, as did Aristotle in the Poetics 1457^{b}, that it is comparison based on analogy or proportions. Others (e.g., Alston, 1964) argue that it is little more than implicit simile.

With the comparative theory of metaphor originating in the writings of Aristotle, it is appropriate to start with his views. Two aspects of

metaphor recur in his treatment of the topic. The first is that metaphor is ". . . constructed on (the) principles of analogy . . ." and seems to be concerned primarily with the comparison of similarities ('resemblances') between two or more objects. This view of metaphor is still accepted in some form by most present day theorists. However, most have expanded Aristotle's basic view to encompass more than analogy. Aristotle seems to have thought that a metaphor consisted of a topic idea "embellished or debased" through comparison to (or resemblance to) an object idea.

A second interesting aspect of the Aristotelian view of metaphor concerns the range of metaphor usage in natural language. In the Poetics, Aristotle states that the command of metaphor is "... the mark of a genius, for to make good metaphors implies an eye for resemblances." But if Aristotle is right and the use of metaphor is a 'mark of genius', it would follow that metaphors are rarely employed by the average user of language. In this view metaphors are infrequent, and are used almost exclusively as ornaments to make language more elegant and beautiful rather than more meaningful. Aristotle makes this last point explicitly in the Rhetoric when he says that a metaphor is created to be "... beautiful either in sound, in meaning, or (in the image that it presents) to the sight or any other sense."

Breal (1964) took exception to Aristotle's implicit notion that the ability to use metaphor was an uncommon occurrence. He suggested that metaphor was a basic component of language use rather than an ornament of language as Aristotle maintained. Breal claimed that ". . . the metaphor remains such at the outset only; soon the mind becomes accustomed to the image; its very success causes it to pale; it fades into a representation

of the idea scarcely more colored than the proper word .... it must be admitted that for the most part metaphors teach us little save what we knew already; they demonstrate only the universal intelligence, which does not vary from one nation to another" (p. 122). For Breal, the original use of metaphor is common among most language users and is an important vehicle for language change.

Stated in more modern terms, Breal also makes a distinction between "novel" and "frozen" metaphor. In discussing this distinction, it is perhaps useful to think in terms of a continuum, with frozen or dead metaphors at one end and novel metaphors at the other. Frozen metaphors would then be defined as metaphors that at one time were novel but through consistent use have become integrated into the language. Phrases like "head of state" and "foot of the bed" are examples of frozen metaphors as are many colloquial expressions. In contrast, truly novel metaphors constitute an original contribution by the speaker to the content of his language (Barlow et al., 1971). Most of the metaphors occuring in everyday language probably lie somewhere in the middle of the continuum rather than at either of the extremes. These metaphors are not totally original to each person who uses them but are definitely not frozen.

Embler (1966) took Breal's hypothesis one step further by suggesting that metaphor was not only a building block of language but also the essential transporter of meaning in language. Embler suggested that "Both speech and thought are often fuzzy and vague, often poverty-stricken, often mere counters of approval or disapproval, often abstractions that have lost their power of expressiveness. But, if there is meaning at all, it is in the metaphor still" (p. 44).

Barlow et al., (1971) presents a simple comparison view of metaphor as part of a more general classification scheme for non-literal language. Metaphor for them is "an implied comparison between two things of unlike nature that have something in common." Using simple, indeed over-simple, examples such as "my mind is a blank" they argue that the attributes of the vehicle are compared to those of the topic in order to generate the "meaning" of the metaphor. Other authors have developed more complex accounts.

For example, Campbell (1975) presents a theory of metaphor as comparison in which every metaphor is an implicit oxymoron. An oxymoron is a juxtaposition of two concepts that have opposite (as opposed to merely different, or incompatable) meanings, such as "the soft harshness of words." Even metaphors that do not contain such obvious opposites can be thought of as oxymorons because the tension in the metaphorical comparison comes about as a result of the incompatibility of the literal meaning of the topic and vehicle of the metaphor. Although the sphere of nonliteral language that is denoted by "metaphor" is not made explicit, Campbell has strong opinions about the implications of his view of metaphor for cognitive and linguistic theory. The power of metaphor comes from its inability to be paraphrased. Campbell notes that "the more powerful the metaphor, the easier it is to perceive the multiple meanings nestled therin." These multiple meanings are, however, not static. New meanings can evolve with different individuals at different times. Therefore, any attempted literal paraphrase will of necessity miss some of the meanings of the metaphor. Campbell also notes that the multiple meanings of metaphor, and the intelligible presence of opposites in the same sentence provide difficulty for many theories of semantic processing. Whereas Campbell is probably right about this the only theory he discusses in

detail is the linguistic theory of Katz and Fodor (1964) which is not a processing theory at all.

The interactionist theory of metaphor. Several authors (Black, 1962; Haynes, 1975; Richards, 1936; Wheelwright, 1962) maintain that while metaphors can be merely substitutes for literal statements, and while they can be comparisons between objects, the psychologically interesting metaphors really involve more. Good metaphors actually relate the thoughts present concerning two subjects, resulting in a meaning that is new and which transcends both. "Placing known characteristics of Y against X may provide new insights, either about Y or about X or about a new third Z, an irreducible synthesis by juxtaposition which is difficult to reduce to a simile or literal language language --- the metaphor creates the similarity rather than (formulating) similarity previously existing" (Haynes, 1975).

Black (1962) views the interactive approach to metaphor as an interplay between both of the two major components (topic and vehicle) of metaphor which he calls the principal subject and the subsidiary subject. The metaphor works by selecting or suppressing features of the principal subject by using features from the subsidiary subject. For Black, the interactive metaphor can be characterized by the following conditions:

1) A metaphorical statement has two subjects - a principal subject and a subsidiary one.
2) These subjects are often regarded as 'systems of things' rather than 'things.'
3) The metaphor works by applying to the principal subject a system of 'associated implications' characteristic of the subsidiary subject.

4) These implications usually consist of 'commonplaces' about the subsidiary subject, but may, in suitable cases, consist of deviant implications established ad hoc by the writer.

5) The metaphor selects, emphasizes, suppresses, and organizes features of the principal subject by implying statements about it that normally apply to the subsidiary subject.

6) This involves shifts in meaning of words belonging to the same family or system as the metaphorical expression; and some of these shifts, though not all, may be metaphorical transfers ....

7) There is, in general, no simple 'ground' for the necessary shifts of meanings--no blanket reason why some metaphors work and others fail (p. 44).

Black suggests that since both substitution and comparative metaphors can be replaced by literal translation they could be dropped from language with no loss of cognitive content. Interactive metaphors, however, are not expendable because they require readers to make inferences and implications rather than merely to react.

Wheelwright (1962) in his influential text, Metaphor and Reality, proposes what he calls a "tensive view" of metaphor. His concepts, however, seem amenable to interpretation in a broad interactive sense, and will, therefore, be discussed here. He analyzes metaphor into two component types, "epiphor" and "diaphor." Epiphor "starts by assuming a usual meaning for a word; (then applies) that word to something else on the basis of, and in order to indicate a comparison with what is familiar." In essence Wheelwright's notion of epiphor encompasses metaphor in the conventional sense as we have discussed it. It expresses a similarity between relatively well known and

relatively unknown subjects. His conception of diaphor, however, seems to add a new dimension to metaphor as previously discussed. Diaphor is exemplified by ". . . 'movement' (phora) 'through' (dia) certain particulars of experience in a fresh way, producing new meaning by juxtaposition alone" (p. 78). In other words, phrases and sentences that may or may not be metaphorical in their own right can create a metaphorical image when placed together in a communication. Wheelwright presents an example of diaphor: "My country tis of thee, sweet land of liberty, higgledy-piggledy my black hen." The intention here, he claims, is not to say anything concerning hens or countries, but rather to make an unpatriotic statement. In diaphor, context with all of its nuances is introduced into the study of metaphor.

The interactionist view of metaphor approaches metaphor functionally rather than grammatically. Thus instead of arguing that a metaphor is a simile without the word "like" or "as," a true metaphor, for the interactionist, is characterized by a "eureka" effect as the elements blend and the new whole is recognized. Haynes (1975) specifically mentions that even similies can have this characteristic if the tensive force in the simile is great enough, as in, for example, "Oh my love is like a red red rose."

Now, while it may be true that proponents of the interactionist view see metaphor in a radically different way from proponents of the comparison view, it may be that the one is still reducible to the other. Perrine (1971) has developed a four category classification scheme for metaphors and comparisons. These categories represent the four possible combinations of explicit or implicit tenor and vehicle. The first category is the one in which both the tenor and vehicle are explicitly stated. Such a metaphor might be "The issue of federal aid to parochial schools is a bramble patch." Here, "federal aid to parochial schools" is being explicitly compared to

"bramble patches." A second category contains metaphors in which the "real" vehicle is not explicitly stated, while the "real" tenor is. One of Perrine's examples of this category is "sheathe thy impatience." The topic is "impatience" and the unstated vehicle is "sword." The metaphor, he claims, compares the two. The third category that perrine describes contains metaphors in which the vehicle is explicitly stated but in which the topic is not. Many proverbs fall into this category in that the literal term is not explicitly stated but the vehicle is. For example, in "don't put the cart before the horse" the literal term is some action having the characteristic of being out of order. Finally, the fourth category consists of metaphors in which neither the topic nor the vehicle is explicitly, such as "Let us eat, drink, and be merry, for tomorrow we shall die" when used to assert that life is short and should be enjoyed while it can be.

Of Perrine's four categories of metaphors, it seems that only metaphors in the first category (those having an explicit topic and vehicle) would be considered by interactionists as being metaphors of comparison. The examples that the interactionist give to illustrate the process of interaction, however, could be merely examples of the other three kinds of comparisons. If this is true, then the "eureka" aspect of interactive metaphors, referred to by Haynes (1975), may be really only the result of discovering what the real vehicle and/or topic of the metaphor is.

Whether or not this is the correct interpretation, the interactionist viewpoint presents an interesting picture of the power and usefulness of metaphor. Wheelwright (1962) holds that "in order to speak as precisely as possible about the vague, shifting, problematic and often paradoxical phenomena that are an essential part of the world, language must adapt itself somehow to these characteristics" (p. 43). Thus figurative language,

especially metaphor is essential to creative thought. We cannot speak of new perceptions and insights into how objects or ideas fit together in terms of language which has only fixed meanings. These views are echoed by Haynes (1975) who feels that the new insight provided by a good metaphor suggests further questions "tempting us to formulate hypotheses which turn out to be experimentally fertile." She implies that good metaphors can literally lead to reasoning by analogy which can give further insight into the extent and nature of concept interrelation both in suggesting theoretical tests of hypotheses and in personal world views. An example in the scientific domain would be the comparison of the atom to a solar system, which suggested a new view of atoms, and one that led to innovative experimentation to explore the extent of the analogy.

Conclusion. "Metaphor" is usually taken to designate just one aspect of natural language functioning. It has been argued, however, that metaphors play a much greater role in language and cognition. To some extent this was Breal's position. However, care has to be taken not to overstate this position. For instance, Shibles (1974), in an extreme example of this approach, views everything as metaphor. He defines metaphor as "nonliteral statement or representation of something else," thus permitting the term to cast its net too wide. According to this view, all of language and cognition is metaphorical. Consider, for example, the noun. A noun is not the same as the object(s) it designates; it only stands for the concept. Therefore, Shibles claims, a noun is a metaphor. Likewise, such things as theories, systems of equations, and models are not the phenomena they hope to describe; they are only our descriptions of those phenomena. They designate only the features of the phenomena that appear to be useful or consistent to us according to our current knowledge.

Such a view of metaphor defines a domain of reference too broad and too general to be useful. It requires that we still designate a subdomain of interest, namely that domain covered by what we normally call "metaphors," which leads us back to the original problem of definition. If literal uses of language are really metaphorical, as Shibles' view implies, we still want to know how non-literal uses are different.

It would seem that one should reject those accounts of metaphor which trivialize it by assigning it an insignificant role in language and cognition. There are good reasons for rejecting simple substitution views, for example. By the same token, views which are too all embracing have to be rejected for they distinguish nothing. Our own view is that metaphor is a pervasive, powerful and necessary phenomenon which needs to be accounted for in both linguistic theory and psychological theory. Metaphors serve many functions. They are vehicles for linguistic change, as Breal saw. This change is effected by the gradual absorption into the lingua franca of expressions which were once novel. We no longer think of "cars running" as a metaphor, or of "legs of triangles" or of "catching colds." The emergence of such "dead metaphors" in a language attests to the fact that there are gaps in what is, or was, literally expressible. Thus, one of the functions of metaphors must be to permit the communication of things which cannot (or could not) be literally expressed. They permit the formulation and recognition of new relationships (Campbell, 1975; Ortony, 1975, 1976; Wheelwright, 1962).

Metaphors fullfil other functions too. They are powerful in their capacity to relate new knowledge to old, and consequently they have great pedagogical value (Green, 1971; Ortony, 1975). In addition it can be argued (see, Ortony, 1975) that they may provide the possibility of communicating

a more wholistic and vivid impression of a phenomenon.

If metaphors have these features, then elements of both the comparison theory and the interactionist theory come into play. On the other hand, it is by no means clear that metaphors are comparisons, although it is clear that they may involve comparisons. It is surely true that metaphors are sometimes used for the purpose of making or indicating a comparison, but on other occasions they may be used to engender a new way of seeing things, as the interactionist view emphasizes. Thus, a more cautious account of the relationship between metaphors and comparisons would be to invoke comparison as a component in the process of comprehending metaphors rather than necessarily the end result of that process. If it is asserted that metaphors are comparisons, we will need to explain the difference between literal and metaphorical comparisons, a difference that we will return to in due course.

Review of Empirical Research

In spite of the lack of unanimity as to the nature and function of metaphor, there has been some empirical research that examines various aspects of the comprehension and production of metaphors both in children and in adults. Our review is of selected work and is by no means exhaustive, but the research that we discuss is representative. We also look at some work in related areas such as analogy.

Developmental research. Developmental research into the comprehension of metaphor is becoming quite a fashionable pastime. It is a topic that is appearing more and more frequently in the pages of leading developmental journals. This increasing interest is an excellent sign, for the question

concerning the child's ability to comprehend metaphors is not only of theoretical interest but of practical importance as well, particularly in reading. It appears to be the case that children need to be able to understand metaphors to understand the texts that they typically encounter in school. For example, Arter (1976) conducted an informal survey of readers and introductory social science texts which are widely read by fifth and sixth grade children. She found that in the Ginn 360 reading series, figurative language occurred at the rate of about ten instances per 1000 words. Even for the earlier grades (Ginn 360, Primer level) the rate was about 2.5 per 1000 words of text. Although a more detailed analysis of the frequency and use of metaphors in reading materials would yield more precise results, it is evident that in order to understand many school texts, children have to understand the metaphors that occur in them. It thus becomes important to know whether there are cognitive constraints on the comprehension of metaphor by children, and if there are, it becomes important to understand the relationship between the literal uses of language that the child can understand, and the non-literal uses that he perhaps cannot.

Asch & Nerlove (1960) examined the development of "double function" terms in children. Double function terms were defined as words that can refer to either physical or psychological phenomena. The physical application was held to be literal, while the psychological application was regarded as metaphorical. Forty children between the ages of 3 and 12 were tested. Asch and Nerlove chose 8 double function words, sweet, hard, cold, soft, bright, deep, warm, and crooked, and asked their subjects whether such terms could be applied to people. If the child said "yes," he was requested

to describe what such a person would be like, and whether there was any connection between this and the physical meaning. Their results showed:

"(1) Children first master the object reference (i.e., the literal use) of double function terms.

(2) Children acquire the psychological (i.e., metaphorical) sense of these terms later, and then apparently as a separate meaning, as if it were independent of the object reference.

(3) The dual property of the terms is realized last, and even then, not spontaneously" (p. 55).

Asch and Nerlove concluded that the capacity to appreciate and produce good metaphor does not emerge until adolescence. There are some problems with this study, however. First, it could be argued that the double function terms that Asch and Nerlove investigated are ambiguous terms, having at lease two distinct lexical entries. If this is the case, it would not be surprising to find that the psychological senses of them develop later, on the grounds that the domains to which they can be applied are less well understood by younger children. That the terms are not perceived as being related by children, in fact provides some evidence for the ambiguity interpretation. Consequently, the findings may have little to do with the development of the capacity to understand metaphors at all. A second problem concerns the relationship between comprehending metaphors and explaining the basis of the putative comprehension. To investigate cognitive/linguistic skills by making demands on metacognitive/linguistic skills is not a very promising approach. To be sure, if a child can explain how he interpreted something then one can draw inferences about his comprehension skills (as well as his skill at understanding his comprehension,and articulating it).

But the fact that a child cannot report how he understood something does not in itself justify the conclusion that he didn't. Problems of this kind are widespread throughout the developmental literature (see, for example, Brainerd, 1973; Brown, in press; Kuhn, 1974).

Studies by Billow (1975) and by Winner, Rosensteil, and Gardner (1976) attempt to show that the development of genuine comprehension of metaphor is related to the child's ability to deal with formal operations, although acknowledging that some "primitive" form of comprehension is in evidence even in 5 year olds. Billow used children ranging in aged from 5 to 13 years old. He distinguished between two kinds of metaphors, "similarity" metaphors and "proportional" metaphors. In similarity metaphors, he argued, two disparate objects are compared on the basis of a shared attribute, as in, for example, "The branch of the tree was her pony" where both the branch and the pony are ridden. In porportional metaphors such as "Summer's blood is in ripened blackberries," Billow argued that "four or more elements must be compared, not directly, but proportionally." Thus, proportional metaphors are implicit analogies. Billow also looked at the children's ability to comprehend proverbs. His results show that where the similarity metaphors were accompanied by pictures 5 year olds could explain the basis of the metaphor about 30% of the time. However, the proportion correctly explained was nearly 75% for 7 year olds and almost perfect for 11 year olds. Billow also reports that "...a stable use of concrete operations (as measured by the inclusion test) is not a necessary condition for metaphor comprehension" (p. 419). With respect to the "proportional metaphors" the results showed a high correlation between the child's ability to explain the metaphor and the development of formal operational thought. This part of the study was only undertaken with children aged 9 through 13 where performance improved from about

40% correctly explained to about 80% correctly explained. However, the apparent ability to engage in formal operations, while used to explain performance on the proportional metaphors, failed to explain the poor performance on the comprehension of proverbs.

A simpler explanation of Billow's findings might be just that the items he chose were of increasing difficulty on all kinds of dimensions. It is clear, for example, that overall, the proverbs involved more complicated, syntactic constructions, a greater proportion of relatively low-frequency words, and far more complicated demands on knowledge of the world, physical, social, cultural and proverbial. The increase of comprehension with age almost certainly reflects nothing more nor less than a greater probability of an already learned acquaintance with more of the proverbs. Similarily, the proportional metaphors are indeed more complex in structure than the similarity metaphors, and they too involve more knowledge of various kinds. Indeed, the authors of this review found some of them very obscure. We are inclined to attribute the problem to the stimulus materials rather than to the absence of our own formal operations!

This study is noteworthy for its problems. Again we see the demand on metacognitive skills; they are as likely to be age and stage related as in the comprehension of figurative language itself. Again we see problems with the underlying theory. How can ponies and branches share the attribute of being ridden? The whole point of the metaphor is that the branch is being "ridden"metaphorically. Finally, the results seem to allow one to conclude little more than that more difficult linguistic/cognitive tasks are performed better as children grow older.

Good empirical work on the development of metaphoric understanding must control for pre-existing knowledge. The failure to do this renders the Billow study rather unrevealing, and it also turns out to be a problem for the interesting study described in Winner et al., (1976). They hypothesized three levels of metaphoric understanding prior to mature comprehension. The first level is the "magical" level, the second the "metonymic," and the third they refer to as the "primitive metaphoric." Each of these levels, they suggest, can be regarded as a stage in the development towards the mature comprehension of metaphors. At the magical stage the interpretation is made literal by the mental construction of a suitable scenario or magical word. At the metonymic stage the terms in the metaphor are taken to be somehow associated, and in the "primitive" stage true metaphoric comprehension is partially present. For example, one of the items they presented was "The prison guard was a hard rock." The magical interpretation would be that the guard was (turned into) a rock. The metonymic might be that the guard worked in a prison with rock walls, and the primitive metaphoric that the guard was physically tough or hard. Children between 6 and 14 years of age were read the "stories"- actually just context-independent sentences - and they either tried to explicate the meaning, or they selected the meaning in a multiple choice test. Their results showed that metonymic and primitive responses were predominant for 6, 7 and 8 year olds. Genuine metaphoric responses dominated those of 10, 12 and 14 year olds. The younger children had fewer magical responses than metonymic and primitive, but more than older children. These results do suggest that older children are more likely to select or offer genuine metaphorical interpretations than younger ones. They do not, however, establish that younger children cannot properly interpret metaphors. In the multiple choice

condition, for example, there may have been a response bias in favor of interpretation consistent with the kind of stories children read. Young children are exposed a great deal to stories about magical worlds. Perhaps a more serious problem lies in the fact that the stories were not really stories at all; they were isolated sentences without contextual (textual) support. It is almost certainly the case that the ability to deal with isolated sentences improves with age. Finally, the explication task again makes demands on metacognitive skills. It might be interesting to replicate the multiple choice condition but to present the choices in order of difficulty as hypothesized by the stage approach. If the first choice were to be genuine metaphoric and the last magical, the child would be given a better chance to entertain the possibility of a genuinely metaphorical interpretation. The real question to be answered is can young children understand metaphors? To answer it, they must be given the maximum opportunity to do so since their relatively impoverished knowledge of the world and of the conventions of figurative language mislead them into selecting more familiar interpretations.

Gardner (1974) conducted a study to determine whether or not the ability to make metaphoric links could be found in preschool children. Also an examination of the development of the ability to comprehend metaphor was attempted. Gardner proposed that the ability to project sets of antonoyms or "polar adjectives," whose denotation within a domain is known, into a domain where they are not ordinarily employed, could be considered a demonstration of the ability to comprehend metaphor. The experimental procedure involved using five pairs of polar adjectives as stimulus items to be mapped onto diverse domains. These items were presented to 101 subjects at four age levels: the mean age of subjects in each of the groups was 3.5 years, 7 years, 11.5 years,

and 19 years. Subjects were given a set of stimulus words (e.g., cold/warm) and told to relate them to other adjective pairs, which encompassed five different modalities (example, blue/red, which color is cold and which is warm?). The results showed a decrease in the number of errors made with increasing age except for the two oldest groups. Preschoolers, however, averaged only 8.91 (of 25 possible) errors. Gardner noted that close analysis of the data revealed several factors which seemed to contribute to the superior performance found in older subjects. These factors included the knowledge of physical laws, cultural conventions, a variety of connotative meanings for words, and the ability to find abstract connecting terms. Gardner's conclusions were that preschool children could perform metaphorically at adult level if the metaphors lay within the realm of their experience. A problem with this study might be the role of pre-established associations. Thus relatively high performance of even the young children might be due to their previous acquaintance with expressions such as "red hot," or "blue with cold." Consequently, it is not clear that the task Gardner chose exploits or reflects childrens ability to handle metaphor.

Gentner (in press) compared children and adults on the basis of a task rather different to those used in the studies cited so far. She suggested that having subjects try to map body parts or facial features onto pictures of objects (mountains, cars and trees) would provide a test of metaphorical ability insofar as the later had an analogical component. In the experiment, subjects (20 children aged 4-5 ½ and college sophomores) were asked questions of the form: "If the mountain (in the picture) had a nose where would it be?" The results of the study indicated that the children were as good at the task as were adults. Gentner concludes that her results

"weaken the position that young children lack metaphorical ability, and are compatible with the hypothesis that such ability is present at the outset of language use."

Most of the research that we have discussed so far seems to suggest that whereas the ability to comprehend metaphors increases with age, there is some rudimentary ability quite early on. We now move on to look at some more naturalistic investigations, into both production and comprehension. We shall also examine the effects of attempts to train children to comprehend metaphors.

Grindstaff and Muller (1975) reviewed and summarized a national assessment on response to literature. One aspect of this assessment consisted of determining the ability of children to comprehend metaphor. Subjects included persons aged 9, 13, 17 and adult. Results indicated that comprehension of metaphors increased with age up to age 17. Adult performance dropped off somewhat. This result was attributed to the effect of adults being out of school. Even though comprehension increased with age, 45% of the 9 year olds were able to understand each metaphor. Sweet (1974) looked at the use of nonliteral language development in writing in grades four through six. He took three kinds of samples from 81 subjects, a poem, a description, and a story. Scoring of the samples was done in terms of the occurrence of alliteration, apostrophe, hyperboles, irony, metaphor, personification, and simile. Sweet found that more nonliteral language was found in the poems and the descriptions than in the stories. No increase in usage was found between grades. As a final analysis, Sweet had a panel of "expert" judges rate the quality of each of the student's productions. He found that the judges tended to consider the use of figurative language indicative of superior products. Because of this result, Sweet suggested that instruction in the use of

figurative language be built in composition curricula at grades four through six. When such instruction is attempted, there is evidence (Horne, 1966; Pollio and Pollio, 1974) that it is effective. This seems to be true both for instruction in using figurative language, and for instruction in understanding it. Pollio and Pollio (1974) examined the ability of third to sixth grade children to use figurative language. They also compared two methods for increasing such usage: a commercial series of instructional texts designed to increase figurative language production, and a set of author made lessons. Tasks of composition, elaborating comparisons between objects, and generating multiple uses for objects were included as the dependent variables. Results indicated (1) that children use metaphorical language as early as third grade, (2) that children used more dead than novel metaphors in their compositions and descriptions of multiple uses for objects, (3) that children use more novel than dead metaphors in the comparison task, and (4) that this pattern changed somewhat with grade, achievement level, and socioeconomic status.

Horne (1966) attempted to teach sixth graders how to comprehend figures of speech. He presented 73 sixth graders with 24 word sessions spread over seven months. The sessions were designed to increase comprehension of the anological nature of figurative language and to increase the production of such language in the children's writing. When compared to 72 children who had not received the training, the experimental group performed significantly better than the control group on the comprehension of, but not the use, of figurative language. Age, sex, and socio-economic status were not related to either comprehension or use of metaphor. Intelligence was related to comprehension but not to use. This study demonstrated that children can be taught

to increase their comprehension of metaphor.

That there is a close topical connection between metaphor and analogy is undeniable. Both the Gentner study and that by Horne capitalize on it. We therefore will discuss a couple of studies explicitly concerned with the development of analogical reasoning.

Khatena (1973) examined the ability of children and young adults between the ages of eight and nineteen to produce analogies. He chose his subjects on the basis of high scores on a test he developed called "Onomatopoeia and Images." This test consistend of presenting stimulus words and having the individual produce a word image for it. The responses of the 284 highest scoring subjects were analyzed to determine which kinds of analogies these "high creative" children were using. Khatena classified his analogies into four types: personal (comparing oneself to another thing); direct comparisons between objects; symbolic (comparing object which all symbolically represent the items of reference, such as "sharks tearing at a marlin" for critics analyzing writers); and fantasy (one part of the comparison is an imaginary phenomenon such as Satan). Khatena also classified the level of each analogy. Simple analogies were single words that expressed single thoughts. Complex analogies required several inferences. Of a total of 4,960 analogies, 83.6% were direct comparisons; of these 81.2% were single. Although the ability to produce complex analogies did increase with age. Khatena concluded from these findings that relatively young children can produce creative analogies, and that creativity can perhaps be taught by instructing people to use simple, direct analogies.

Levinson and Carpenter (1974) considered the ability of 42 children, aged 9, 12, and 15 to complete quasi and true analogies. True analogies

were structures, as, for example, "Birds are to air as fish are to _____," whereas the corresponding quasi-analogy would be "Birds use air, fish use _____." Thus, quasi-analogies actually specified the relationships while true analogies did not. The results showed that 9 year olds did significantly better on the quasi-analogies than on the true analogies, but were still able to complete 50% of the true analogies (8 of 16). Both the 12 and 15 year olds performed the same on the quasi and true analogies and were significantly better than the 9 year olds in both cases. The ability tc give reasons for the choices made on the analogies increased with age. The implications of Levinson and Carpenter's study were threefold. First, nine year olds can use analogies and the ability to do so increases with age although performance is fairly stable between ages 12 and 15. Second, the ability to explain choices grows with age. Third, perhaps quasi-analogies can be used to increase skill in true analogies.

Conclusion

Developmental research into the comprehension of metaphor seems to be plagued with many and difficult problems. These problems tend to be shared and include such things as inadequate controls over pre-existing knowledge, inadequate control over difficulty of materials, and over-reliance of meta-cognitive/linguistic skills, and the utilization of experimental tasks not clearly related to the comprehension of metaphor. It is interesting that children can be taught to improve their comprehension of non-literal uses of language and it is also interesting that they appear to have reasonable analogical skills at an early age. The possibility therefore exists that the decrements in performance for young children could be largely accounted for in terms of a paucity of relevant experience of the world and of the use of metaphors, rather than to the constraining influences of cognitive development. A greater emphasis on determining whether there are any conditions

under which young children do comprehend metaphors, and if so what those conditions are, might be more revealing than more categories of developmental trends.

In defense of those who have been working in the field, it should be noted that the area is very difficult to investigate and many of the problems appear, at least at first sight, to be inherent in the nature of the field. Literal controls are often difficult if not impossible to generate especially if the emphasis is on investigating metaphorical uses of individual words. We will have more to say on this issue later on.

Finally, in looking at the production of metaphors and the results of training, care has to be taken in judging what is and what is not true metaphor. Matter and Davis (1975) address this problem in their discussion of the developmental research done on metaphor:

> "In early stages of language acquisition children produce categorical errors and mistakes that can be taken as metaphorical expression but are not. The child is in the process of learning to recognize and correct perceptual, cognitive, and conceptual 'error'.... As these 'errors' are corrected, children develop a highly literal linguistic behavior. In this intermediate stage, children are getting their categories straight ....Following the literal stage. children again enter the world of category mistakes intentionally.... they discover metaphor"(p. 75).

In short, the expressions scored as metaphorical in some of the research cited above might simply be a child making a "perceptual, cognitive or conceptual error." This cautionary note is also important for research on older subjects.

Research with mature language users. Serious empirical investigations into the comprehension of metaphors in adults is much less widespread than developmental research. There is, however, quite a lot of research on related issues, of which we will discuss only a little.

Koen (1965) suggested a psycholinguistic orientation to the study of metaphor. A prerequisite of this orientation is the assumption that literal terms and metaphors can be connected by common verbal associations in a semantic interface (the interface contains associations common to both the literal and metaphorical terms). Differences between metaphorical and literal meanings are characterized by unique associations. Koen predicted that metaphorical meanings could be derived from literal meaning through a search for common linking associations. Koen tested his hypothesis by having subjects view sentences like:

The sandpiper ran along the beach leaving a row of tiny {stitches / marks} in the sand.

In accordance with the verbal associative hypothesis Koen made three specific predictions: (a) cue words originally generated from the metaphorical terms should elicit the choice of the metaphoric terms most often, (b) cue words associated more frequently with the literal term should promote the choice of that term, (c) interfaced associations should cue both terms equally well. The results mirrored these predictions exactly. But, as with so many of the developmental studies, this study suffers from a weak connection between the experimental task and the comprehension of metaphor. Indeed, it seems to reduce to a demonstration that highly associated words tend to be good cues for one another. Furthermore, the verbal associative argument itself is not well developed. Complex metaphors with many different facets would not be easily handled by it, although to some extent, this criticism is a general problem

for laboratory investigations into the comprehension of metaphor. Finally, Paivio (1971) has suggested that an imagibility interpretation could be made with the data. The cue words might simply be arousing images of the choice words, thereby facilitating their selection.

Perhaps the best studies carried out with either adults or children are those described by Verbrugge and McCarrell (1973). They take the position that metaphors work by making assertions through the use of comparisons. An example of one of their items is the metaphor "Billboards are warts on the landscape." Here "billboards" is the topic, "warts" the vehicle, and the ground is something like "an ugly protrusion on a surface." Verbrugge and McCarrell suggested that in order for comprehension of a metaphor to occur, the unexpressed ground between the topic and the vehicle must be inferred at acquisition. If this assumption is true, then according to the principle of encoding specificity (Thomson & Tulving, 1971) the inferred ground should be an effective recall prompt. To test this hypothesis, two lists of fourteen metaphors and similes were prepared. Topics for each list were held constant while the vehicles (and hence the grounds) were allowed to vary. For example, list A might compare billboards to warts while list B would compare billboards to yellow pages. The experimental sentence lists were presented to subjects (via tape recording) along with instructions to think about and understand the sentences. After completion of the list presentation, subjects received booklets containing written prompts. These prompts were either grounds (relevant or irrelevant), topics, or vehicles from the presented sentences. The subjects' task was to respond to each cue by writing the appropriate presented sentence. The results were reported in terms of the mean number of sentences recalled. Vehicles and topics prompted the best

recall with relevant grounds close behind. Irrelevant grounds were significantly less effective than the other three prompts. Clearly, the most important finding was the high level of recall produced by relevant grounds (10 of 14 sentences). It was concluded that relevant processing at acquisition facilitated ground effectiveness as a recall cue. Also, irrelevant or conflicting acquisition experience interferes with this effectiveness.

Verbrugge and McCarrell reported a second study which provided a needed control condition for the first experiment. The control condition involved the presentation of a topic-only list in an effort to provide a measure of the effectiveness of grounds as cues when no biasing direction was availiable at input. During the recall test, both relevant and irrelevant grounds were used as prompts. Subjects were asked to recall only the topics. With these exceptions, the experimental tasks and procedures were the same as in the first study. Recall for topics presented in sentence form, given relevant and irrelevant grounds as cues, was consistent with results from the first experiment. Recall in the topic only condition was located between the two sentence conditions. Both the facilitative effect (relevant grounds) and the interference effect (irrelevant grounds) were highly significant. The medial location of the topic-only condition was theoretically interesting. If metaphor affected comprehension in such a way as to channel attention toward only some of the aspects of the topic, the recall of the irrelevant-ground and topic-only conditions should have been similar. The actual data suggested that both selective attention and repression qualities are involved in metaphor comprehension. Also, normative data were reported with the second experiment which suggested a lack of evidence for an associative interpretation of the experiments.

In summary, Verbrugge and McCarrell draw the following conclusions from their research: (1) comprehension of metaphor is both easy and consistent for adults, (2) comprehension of metaphor involves inferring an implicit, but relevant, comparison between the topic and vehicle, and (3) metaphor directs attention to some aspects of the topic at the expense of others. Although a comprehensive account of the workings of all metaphors (those that do not involve a direct comparison) is not offered, the Verbrugge and McCarrell studies contribute much more than most.

Mayer (1975a; 1975b) provides evidence that metaphors can create relevant learning sets. He presented information about computers to naive students in one of two ways: by use of a model or by applications of rules. His model condition consisted of comparing various functions and aspects of computers with familar situations, in other words, using a complex metaphor. For example, input was compared to a ticket window, output to a message pad, the memory to a chalkboard. The literal presentation consisted of a flow chart representation of computer function, with practice on interpretation and application of rules. Mayer hypothesized that the model condition would facilitate external connections and those subjects in it would be better able to produce new examples, while the rule condition would facilitate internal connections, and subjects in it would be better able to produce flow charts. These hypotheses were confirmed. Models were shown to produce the learning sets postulated by Mayer (1975a). However, it should be noted that the rule treatment, consisting of flow-charting,could also be thought of as a metaphor for computer functioning in which case the study reduces to a comparison of the effectiveness of different representational systems. It would have been interesting to see how the student's previous knowledge of flow-charting or

the other analogies interacted with the treatments.

In a series of studies (Royer and Cable, 1975, 1976; Royer and Perkins, 1975) on facilitating transfer in prose learning, Royer and his associates demonstrated not only that the elicitation of a relevant knowledge set is an aid to learning but also that text materials containing analogies can be used to advantage in facilitating transfer. Royer and Cable (1975) presented subjects with a difficult abstract passage which was preceded by either a concrete passage (describing physical phenomena by analogy to common events) designed to provide a structure into which the second passage could be assimilated, or by an unrelated control passage. These two conditions were compared to a third condition in which the abstract passage was presented first and followed by the passage with analogies. Results showed that subjects' performance in recall of the concrete passages was not effected by the time of presentation (before or after the abstract passage), but that when an abstract passage was preceded by a concrete passage subjects recalled at least 40% more material than those who received the abstract passage first. Royer and Perkins (1975) showed that the pattern of results was maintained in delayed recall. Royer and Cable (1976) attempted to rule out the possibility that the results from their previous study were due to style (concrete or abstract) rather than content (presence or absence of analogies as assimilative aids). The previous results may have been due <u>not</u> to the availability of an assimilative set, but to the fact that having an easy passage first increased attention to the subsequent difficult passage. Therefore, the authors compared the effectiveness of preceding an abstract passage with a concrete passage containing analogies, another abstract passage, an unrelated passage, and abstract passage with analogies (therefore having the same type but different content) or an

abstract passage with illustrations. Results showed that the initial easy concrete passage, abstract passages with analogies and abstract passages with illustrations all facilitated acquisition of the subsequent abstract passage, while the control and abstract passages did not. This indicated that transfer was facilitated by content not style. The entire series of experiments also revealed that concrete passages which contained analogies could elicit a relevant learning set which facilitated learning.

Although the next studies to be discussed do not deal specifically with metaphor or analogy, they are concerned with related subjects. It is hoped that discussion of these related areas might allow some insight into the functioning of figurative language. Bock and Brewer (1976) describe a study concerned with the literal and figurative interpretations of proverbs. Their primary purpose was to demonstrate that subjects process both the literal and figurative interpretations of proverbs, and that using a procedure designed to enhance figurative comprehension will greatly improve the level of figurative recognition.

The experimental materials were composed of proverb sets containing six members each: (a) the original proverb (OP), (b) surface transformation of the OP (a literal paraphrase of the OP), (d) both synonym and surface transformation, (e) a proverb with the same literal meaning as the OP but a different figural meaning, (f) a control proverb with both figural and literal differences from the OP. Twenty different proverb sets of this form were developed. The manipulation was composed of two treatments. Subjects were presented with one of the several proverb lists and given a two alternative forced choice recognition test. Another group of subjects received a similar proverb list but took a figural comprehension test after each presentation

(again a two alternative forced choice test). These subjects then received a recognition test like subjects in the first group. The results of the experiment suggested three main outcomes. First, improved comprehension of the figural meaning at acquisition (deep comprehension condition) led to increased recognition of figural meaning on the criterion test. Second, at the time of the recognition test (5 minutes after lists were presented) subjects showed good memory for the original syntactic structure, lexical information, literal meanings and figural meanings. Bock and Brewer suggest that this illustrates the weakness of models such as HAM (Anderson and Bower, 1973) which treat only one level of processing. Third, contrary to other research (Sachs, 1967), subjects in this study demonstrated extremely good memory for items at all levels of processing, including surface structure. It could be, however, that the two-choice testing procedure created this latter result. This study seems to illuminate some interesting possibilities for research with metaphor. Since good memory is exhibited for both literal and figurative meanings a reconstructive approach to metaphor might be feasible. That is, the figurative meaning of some metaphorical communication could be constructed at recall as well as at acquisition. The results suggest that if procedures are used which require the comprehension of a figurative level of meaning, memory for the figural meaning will be quite good. It should be noted, however, that in Bock and Brewer's deep comprehension task subjects actually received two exposures to the correct figurative interpretation. This might account for the high figural recognitions scores just as well as the deeper processing hypothesis does.

Both Osborn and Ehninger (cited in Reinsch, 1971) examined the functions of metaphor in rhetorical discourse. On the basis of an informal, subjective, evaluation they concluded that the metaphorical process was characterized by

three mental events; error, puzzlement-recoil, and resolution. Error was thought to encompass the hearer's initial unsuccessful attempt to understand the metaphoric statment literally. Puzzlement-recoil describes the cognitive difficulty (dissonance?) which follows error and leads to the rejection of the literal interpretation. Resolution suggests the mental discovery of similarities between the topic and the vehicle of the metaphor. The Osborn and Ehninger paradigm seems to suggest rather naturally the research tract recently taken by Brewer, Harris and Brewer (1976).

Using proverbs again, Brewer et al., postulated that unfamiliar proverbs are understood in two sequentially ordered steps. The notion is that on encountering a proverb one first attempts to comprehend the literal meaning, then only after that is accomplished, is the figural meaning processed. Fifty-six proverb sets each containing five components were constructed. These components were: (a) the original proverb, OP, (b) a literal-same-paraphrase of the OP which maintained the literal meaning, (c) a literal-different paraphrase, (d) a figurative-same paraphrase, (e) a figurative-different paraphrase. The subjects were instructed to read and understand two sentences (selected from the above options) and to determine if they had the same or different meanings. Experimental pairs were constructed by randomly combining OP's and their paraphrases. Half the time the OP was presented first and half the time, second. It was found that it took subjects longer to understand the figural meaning when the OP was presented second, but not when it was presented first. This interaction was expected because when the OP was presented first both figural and literal meanings were available to the subject. When the OP was presented second, the figural meaning had to be comprehended from the literal meaning. These

results seem to support the hypothesis that comprehension of the literal level of meaning proceeds the comprehension of the figural level. Brewer et al., conclude that, since both metaphors and proverbs have figural and literal components this finding should generalize to the more global case of metaphor.

Conclusion. Research into the comprehension on non-literal uses of language done with adults has yielded only slightly more information than that done with children. The Verbrugge and McCarrell experiments do seem to reveal an interesting quality of metaphor. The fact that the inferred ground of a metaphorical relationship acts as a good recall cue seems to indicate that some sort of special mental processing or cognitive work is done when a metaphor is presented. The nature or depth of this processing, however, is not revealed. The research of Brewer and his associates would indicate that processing non-literal uses of language does involve processing the literal meaning first. This is not altogether surprising when one considers that the literal meaning obviously contributes to the anticipated non-literal interpretation.

If there is a problem with the adult research it is primarily that it fails to investigate a number of important questions. What is the relationship between the literal and non-literal meaning? To what extent does context facilitate the comprehension of metaphors. What communicative benefits do they bring? There are other questions too, which need to be investigated. The box has been opened, but the contents are yet to be examined.

Some Recommendations for Future Research

Traditionally, the study of metaphor has been predominately undertaken by scholars of philosophy and literature; it has been slow to find its way into the domain of psychology and education. Yet, an understanding of metaphor and the comminicative functions it serves is not only an interesting problem area in psycholinguistics, but also has important implications in education. We therefore now address the question of the relevance of the study of metaphor in psychology and education.

The importance of studying metaphor. Cognitive psychology has, during the last few years, seen a surge of interest in models of semantic memory and language comprehension, yet few of the theorists who have worked in this area have considered metaphor to be sufficiently important to warrant their attention. Kintsch (1972,1974) and to some extent Collins and Quillian (1972) might be regarded as exceptions to this claim, but still, while acknowledging the problem, they have little to say about it. Rumelhart and Ortony (1977) also discuss the way in which their knowledge representational "schemata" might facilitate the comprehension of metaphor, but again their discussion is rather peripheral to their main concerns. We have suggested that metaphor is not some freak occurrence disturbing the otherwise smooth flow of ordinary literal language use. Metaphor, particularly when considered along with other non-literal uses of language, is a very pervasive phenomenon. Any psycholinguistic theory which does not handle metaphor is thus incomplete, and any which cannot handle it is inadequate. Of course, it must be recognized that an account of the way in which people comprehend non-literal uses of language is a fairly heavy demand to place upon a theory of language comprehension (indeed, it might be objected that it is an unfairly heavy demand!), but it

seems to be a crucial test. It is probably the case that different theoretical notions lead to different predictions about the comprehension of metaphor, although it would be necessary to extend current theoretical positions beyond existing statements of them to make any kind of prediction at all.

In terms of the robustness of the models that psychologists have proposed for the way in which people understand language and the way in which they store the results of that understanding metaphor could pose some quite serious problems. For example propositional models, which are characterized by the representation of all knowledge and comprehended sentences as propositions (e.g. Anderson and Bower, 1973; Kintsch, 1974), seem to be forced to treat metaphors as semantic anomalies. In fact Kintsch goes to far as to suggest that semantic anomaly is a necessary condition for something's being a metaphor. Inevitably, this leads to an impasse: how to distinguish metaphor from "genuine" semantic unacceptability. Such theories seem to be hampered by their reliance on too rigid a notion of word meaning (see, for example, Anderson and Ortony, 1975) and this constraint is likely to lead to an overhasty characterization of input sentences as being semantically anomolous. The representation of word meanings in such models simply fails to permit the kind of flexibility that would be required to make sense of a metaphor. In any event, models of this type, were they to attempt to make sense of metaphors, appear to require a two stage process. The first stage would involve an attempt to impose a literal meaning on the input sentence, which, presumably, would fail. The second stage would involve an attempt to "recover" from the "error." The only psychological account of this process that has been offered is that of Kintsch who proposes

that the anomalous input string be coverted into an explicit comparison. This proposal has some merits, but it again runs into the problem of distinguishing genuine metaphors from mere nonsense or falsehoods.

An alternative representational arrangement is that advocated by schema theorists (see, Minsky, 1975; Schank, 1975; Rumelhart and Ortony, 1977). At least in some versions of this approach, knowledge is represented in a rather more flexible manner than in propositional models. Whereas in propositional models word meanings are represented as propositions about the "core" meaning, in schema theory what gets represented is knowledge associated with the things to which words refer. Thus, what a schema contains is not so much information about what is necessarily the case, but information about what is usually or normally the case. For example, in a propositional model the meaning of a word like "cow" is pretty much exhausted, in the best Aristotelian tradition, by a statement of its species and differentia. Thus, a cow is a mature female of cattle. By contrast, the schema for "cow" would include a great deal of information people have about cows; that they are domesticated, provide milk etc. The structure of a schema is of a series of variables together with relationships between them. Whereas there are constraints on the values that the variables may take, these constraints are rarely absolute, although some values are more typical than others. This kind of representational system appears to offer greater flexibility for matching incoming information to previously stored knowledge, and with this flexibility comes a better prospect for dealing with non-literal uses of language. The effect of a metaphor would be to change the shape of the range of values that variables within a schema can and do take on. The metaphorical interpretation would be achieved by finding that schema or those schemata which matched the input changes in variable ranges was the least.

Propositional models and schema-based models might handle the comprehension of metaphors in rather different ways: the first requiring some kind of special processing, the second, perhaps not. There is another class of theory which might make yet different predictions. The theories in question are not really incompatible with either of the above types. We refer to the so-called network theories (e.g., Quillian, 1968; Collins and Quillian, 1969, 1972; and Collins and Loftus, 1975). Network theories can be regarded as being more process-oriented than structure-oriented. They say little about the internal structure of the concepts which constitute the nodes of a semantic network, preferring to concentrate on the consequences of a spreading activation mechanism for "moving about" within that network. Thus, a network theory is compatible with, for example, a schema theory, since the nodes could represent schemata. In any event, network theories or at least the spreading activation processing aspect of them, could make yet different predictions about the processing of metaphors. The basis of the spreading activation process is the notion of an "intersection," namely, a concept which is associatively connected and, consequently, activated, from two or more of the concepts in the input string. The intersection has to be semantically "close" to the originating nodes so as to prevent the situation in which every node in the network counts as an intersection for an arbitrary pair of originating nodes. Such a mechanism seems rather well suited to handling metaphor. This is because it would permit the ground of the metaphor to be determined by the intersection or intersections arising from activation spreading from the topic and the vehicle. The incompatible aspects of the two, namely those aspects of the topic and vehicle which jointly gave rise to the tension, would be much less likely to result in an intersection. Thus, spreading activation seems to offer the prospect of a fairly automatic way of determining the ground of a metaphor without invoking all the irrelevant aspects of it. It may be that these

observations amount to little more than that the vaguer the theory, the more likely is it to be able (in principle) to handle metaphors. This is probably true. Nevertheless, it is difficult not to speculate as to how various theoretical orientations might deal with the problem.

How these various theories are to deal with metaphor must depend on the facts; facts which have yet to be determined. We need to know much more than we do now about what happens when people process figurative language. We need to know whether metaphors take more time to process, we need to know how context interacts with processing time. Is the processing of "dead" metaphors and of idioms different from the processing of creative, novel metaphors? There are many other questions. But to adequately investigate such issues requires a more powerful experimental paradigm than is currently available. For one thing, it requires a paradigm that permits the comparison of metaphorical with literal uses. Such a paradigm has been developed by the first two authors and their collaborators and will be outlined in the next section.

If the study of metaphor is important in cognitive psychology, it is no less important in education. The most trivial reason for this is that education is largely concerned with the acquisition of knowledge through the medium of language. If metaphor is a ubiquitous linguistic phenomenon, then knowing how metaphors are processed, and what constraints exist on their comprehension, is part of understanding the learning process. However, there are more profound ways in which metaphor is of concern in education, reasons concerned with pedagogy and radical conceptual change. In discussing the role of metaphor in education, it is necessary to broaden our notion of metaphor somewhat. For although metaphors occur in instructional materials and in instructional dialogue at the level of individual sentences, the really crucial role they play is in systems. We might call them extended metaphors, or analogies, or even models.

It is common knowledge that it is easier to understand new things if they are cast in terms of old. In the field of developmental psycholinguistics this fact has been expressed by Slobin (1971) in terms of the principle: "New forms first express old functions, and new functions are first expressed by old forms." Apart from the fact that this principle in itself is consistent with the generation of metaphors by children, it seems to be a general principle of learning. It follows that the manifestation of the principle will occur through a process which in some way compares, explicitly or implicitly, the old function served by the old form and the new function served by it. One of the ways in which such comparative relationships can be drawn out is by the use of metaphors, similes, analogies and models.

It would be a mistake to restrict one's concern with the role of metaphors in learning to the learning of subject matter. There are more global, educational processes in which metaphor plays an important role. Petrie (1976) discusses these issues when he talks about problems of interdisciplinary work, particularly in the context of the problems posed by the fact that different disciplinary orientations gave rise to different ways of perceiving the same phenomena. Petrie claims that the reason for this is that different disciplines presuppose different "cognitive maps," by which he means "the whole paradigmatic and perceptual apparatus used by any given discipline. This includes, but is not limited to, basic concepts, modes of inquiry, problem definition, observational categories, representation techniques, standards of proof, types of explanation, and general ideas of what constitutes a discipline" (p. 11). He argues persuasively that the key pedagogical tool for bridging disciplinary gaps is metaphor, conceived of in the same broad way in which we do here.

We are of the opinion that good research could contribute to a better understanding of the nature and role of metaphor in human thought. Our view has suggested that little good research has been done and that at least one of the reasons for this is that there is not available at the moment a theoretical account of the nature of metaphor which can be frutifully employed in psychological and educational research. If this review is to make a positive contribution, we hope it will do so by pointing to a possible way of alleviating this deficiency.

An approach to the study of metaphor. The cognitive psychologist is concerned with when and why people use metaphors, when and how they understand them, and how the processes presumed to underlie their use and comprehension differ from and are related to those processes involved in the comprehension of literal uses of language.

The solution to these problems do not lie in diagnosing, or attempting to diagnose, peculiarities, such as semantic anonaly, in the surface structure of an utterance. It is for this reason that Kintsch (1974) fails to find an adequate solution. It simply is not the case that all metaphors are semantically anomalous, consequently, semantic anomaly cannot possibly be a necessary condition for something's being a metaphor.

The most compelling fact which Kintsch and many others have ignored is that many metaphors are semantically perfectly well formed sentences. Consider, for example, our final sentence of the last complete section (p. 36), or:

(1) Regardless of the danger, the troops marched on.

It is a perfectly normal English sentence, and is certainly not semantically anomalous. What determines whether it is a metaphor or not is the context in which it is used. In the context of an army marching to battle it is likely

to require a literal interpretation. But in other contexts it is not. For example, consider its role in (2):

(2) The children had been annoying their teacher all morning, and she was becoming increasingly irritated by their unruly behavior. She simply did not know how to stop them climbing on the chairs and tables and throwing all manner of objects about the room. She decided to threaten to punish every one of them if they did not stop. As loud as she could, she shouted her warning. She would make them all stand outside in the rain. Regardless of the danger, the troops marched on.

In the context of the school teacher and her problem, the entire sentence (1) is a metaphor. It is not really a case of a word of phrase being applied to an object it does not literally denote, for none of the substantive words literally denote their usual objects or concepts. Standing in the rain is hardly a danger, there are no real troops and there is no real marching. But surely one cannot argue, as Kintsch wants to, that because (1) is not semantically anomalous it is not a metaphor. The importance of the fact that metaphors need not be semantically anomalous has not been totally overlooked. It is implicit in Perrine's (1971) four categories of metaphor. In his fourth category, Perrine argues that both the topic and the vehicle are implicit. Perrine does not explicitly discuss the role of semantic anomaly in metaphor. On the other hand both Reddy (1969) and Van Dijk (1975) emphasize the fact that it is not necessary for metaphors to be semantically anomalous.

Reverting to our example, what makes (1) a metaphor is not that it is semantically anomalous, but that it is pragmatically, or contextually anomalous. The metaphorical meaning of, say, (1), is related to certain implications of its literal meaning, for whatever the literal meaning of (1) is, its metaphorical meaning in the context (2) will be those contextually relevant salient

components of its literal meaning which do not conflict with the context. For example, one implication of the literal meaning of (1) is that a group of people continued doing what they were already doing without concern for the consequences. Another is that these consequences were undesirable, and another that the people were aware of this, but stubbornly unconcerned, and so on.

The selection of salient aspects of the literal meaning of a metaphor which are not incompatible with the context is referred to as a process of tension elimination in Ortony (1975). In the case of a metaphor such as (1) in (2), the tension is caused by the incompatibility of the literal interpretation of (1) and the context in which it occurs. The notion of metaphorical tension is just as applicable to semantically well-formed sentences like (1) as it is to semantically anomalous sentences such as (3) which constituted the prototypical metaphor for early research.

(3) The ship plowed the seas.

In both cases, (1) and (3), comprehension seems to require the elimination of aspects of the meaning of expressions that when interpreted literally give rise to tension.

Perhaps we should now try to reformulate a definition of metaphor. A first condition for something's being a metaphor appears to be that it is contextually, or pragmatically anomalous. This means that if it is interpreted literally, it fails to fit the context. This allows (1) to be a metaphor in the context of (2), while excluding it in those cases where it is literally interpretable. Consequently what is a metaphor is not a sentence, but a token of a sentence or an utterance. The contextual anomaly condition also allows us to include (3) since it will fail to fit with almost all

conceivable contexts. Now while the pragmatic anomaly condition is a necessary condition, it is not a sufficient condition for it failes to exclude cases such as (4) which are unresolvable semantic anomalies:

(4) Regardless of the wavelength, some anger programmed the bus sandwich.

It might be argued that in some possible context (4) could be used as a metaphor, or even literally, and if this is indeed true then one would not want to exclude it. But, for the sake of argument let us suppose that (4) is unresolvable as a semantic anomaly. This suggests a second condition, namely, that for something to be a metaphor it must be possible, in principle, to eliminate the tension. It seems, then, that we have two conditions which, taken together, are necessary and sufficient for a linguistic expression to be a metaphor. The expression should be contextually anomalous, and the metaphorical tension must be in principle eliminable. These conditions ought probably to be elaborated in terms of the speaker's intentions. One might for example claim that for a speaker to intend to utter something methaphorically he must believe that both conditions hold. If he doesn't, he still might produce a metaphor but by accident. It would be an accident in the sense that a hearer may wrongly attribute to the speaker certain intentions which he never had, consequently communication may break down.

The two important components of metaphor in this view become the contextual or pragmatic anomaly aspect, and the tension elimination aspect. The former can be handled at the theoretical level by invoking a Gricean analysis of the violation or apparent violation of conversational rules subsumed under the cooperative principle (see Grice, 1975). The latter has been discussed in Ortony (1975).

With this view of metaphor it is possible to conduct empirical research that provides adequate controls. One can investigate the comprehension of metaphors using a variety of dependent measures while controlling for surface structure characteristics. This can be done by comparing performance using a target item when its preceding context induces a literal interpretation to the same target when the context induces a metaphorical interpretation. One can also control for meaning since it is much easier to generate a literal paraphrase of a whole-sentence metaphor than it is of a part-sentence metaphor (compare the ease of generating a literal equivalent of (1) as opposed to (3).

Whether or not whole-sentence metaphors are easier or more difficult to understand than part-sentence metaphors is a question which cannot yet be answered. But our feeling is that much more can be learned using whole-sentence paradigms and that <u>that</u> is the place to start.

As our review has shown, many theorists believe that metaphors are (intended to suggest) comparisons. The account that we have given suggests that the role of comparison is in the tension elimination process itself. Undoubtedly some metaphors are <u>intended</u> by their authors to focus on comparative aspects, but others may be vehicles for understanding things in new ways, or for expressing what is literally inexpressible. In such cases comparison may be better regarded as the means of comprehension rather than the purpose of it. In any event, invoking comparison to explain metaphor has its own problems. For one must distinguish between literal comparisons and non-literal comparisons and that problem is as difficult as any.

Conclusion

We have seen that research into the comprehension of metaphor leaves something to be desired, and we have suggested that an inadequate definition or theory of metaphor is to some extent to blame for this. In an effort to contribute to the solution of this difficulty we have suggested an approach to research into the comprehension of metaphor, and along with that, we suggested a general purpose definition. Before finishing, a few additional remarks are necessary to place our definition of metaphor in perspective.

It will be recalled that two major approaches to the theory of metaphor were discussed -- the comparison theory, and the interactionist theory. In addition reference was made to the substitution theory. We took the position that the comparison theory was inadequate if interpreted as meaning that all metaphors are (intended as) comparisons. Furthermore it was suggested that since some comparisons can only be conceived of as non-literal, the comparison view fails to explain the non-literal aspects of metaphor. Consider the following metaphor:

(5) Abdul-Jabbar is professional basketball's Sears building.

Here it is assumed that Abdul-Jabbar is the tallest player in professional basetball, and presumable this is what someone uttering a token of (5) would be meaning to assert. But if this comparison is taken to be the implicit "meaning" of (5) then it is presumably equivalent in meaning to the simile (6):

(6) Abdul-Jabbar (the professional basketball player) is like the Sears building.

The point that needs to be emphasized is that (6) is not a literally true comparison, for the topic and vehicle are more dissimilar than they are similar. A literal comparison might be something like (7) where the topic and vehicle really are similar.

(7) The Hancock building is like the Sears building.

Now it is of course true that the extent to which these comparisons are appropriate (and are true) depends on the context in which they are used, but taken literally (6) is still a non-literal comparison when compared with (7).

The point of this discussion is to emphasize that in cases where metaphors really are comparisons, the comparisons themselves need to be accounted for in terms of a theory of non-literal uses of language, since those comparisons will often by non-literal ones.

Perrine (1971) is one of the few theorists to have proposed a viable classification of metaphors. As discussed earlier, his fourfold classification is based on the explicit or implicit occurrence of a metaphor's topic and vehicle. We suggested in discussing the "eureka" aspect of the interactionist view that it was perhaps related to a comprehender's discovery of the implicit components of the metaphor. Our definition of metaphor as tension resolvable contextual anomaly is consistent with Perrine's classification in that the implicit elements have to be determined largely by the context. In those cases of metaphor where the topic and vehicle are explicitly stated, the contextual anomaly results solely from the fact that a literal interpretation is false or nonsensical, and this is true for explicitly non-literal comparisons, i.e., similes, as well. In this way, we see our definition as providing a basis for distinguishing metaphors from literal uses of language, in such a way that a taxonomy of different types is compatible with it.

The paradigm we have suggested for pursuing research in the area seems suited to inviestigating metaphors in Perrine's fourth category where both topic and vehicle are implicit It also seems applicable to his second category wherein the topic is implicit and the vehicle is explicit. Perrine's first category is probably better handled by investigating the similes derivable

from the metaphors. Only the third category remains. It might be better to leave their study until the more tractable types have been studied.

The psychological study of metaphor is about to ripen. Its fruits promise to be useful both theoretically, in psycholinguistics, and practically, in education. It is to be hoped that this review can contribute to the ripening of that study.

References

Alston, W. P. Philosophy of language. Englewood Cliffs, N. J.: Prentice-Hall, 1964.

Anderson, J., & Bower, G. Human associative memory. Washington, D.C.: V. H. Winston & Sons, 1973.

Anderson, R. C., & Ortony, A. On putting apples into bottles: A problem of polysemy. Cognitive Psychology, 1975, 7, 167-180.

Arter, J. L. The effects of metaphor on reading comprehension. Unpublished doctoral dissertation, University of Illinois at Urbana-Champaign, 1976.

Asch, S., & Nerlove, H. The development of double function terms in children: An exploration study. In B. Kaplan and S. Wapner (Eds.), Perspectives in psychological theory. New York: International Universities Press, 1960.

Barlow, J. M., Kerlin, J. R., & Pollio, H. R. Training manual for identifying figurative language (Tech. Rep. No. 1). Knoxville, Tenn.: The University of Tennessee, Department of Psychology, September 1971.

Billow, R. A cognitive developmental study of metaphor comprehension. Developmental Psychology, 1975, 11, 415-423.

Billow, R. M. Metaphor: A review of the psychological literature. Psychological Bulletin, 1977, 84, 81-92.

Black, M. Models and metaphors: Studies in language and philosophy. Ithaca, N.Y.: Cornell University Press, 1962.

Bock, J. K., & Brewer, W. F. Comprehension and memory of the literal and figurative meaning of proverbs. Manuscript submitted for publication, 1976.

Brainerd, C. J. Order of acquistion of transitivity, conservation, and class inclusion of length and weight. Developmental Psychology, 1973, 8, 105-116.

Breal, M. Semantics (Translated by Mrs. Henry Cust). New York: Dover Publications, Inc., 1964.

Brewer, W. F., Harris, R. J., & Brewer, E. F. Comprehension of literal and figurative meaning. Manuscript submitted for publication, 1976.

Brown, A. L. Knowing when, where and how to remember: A problem of metacognition. In R. Glaser (Ed.), Advances in instructional psychology, Vol. 1. Hillsdale, N.J.: Lawrence Erlbaum Associates, in press.

Campbell, P. N. Metaphor and linguistic theory. The Quarterly Journal of Speech, 1975, 61, 1-12.

Chukovsky, K. From two to five. Berkeley, Calif.: University of California Press, 1968.

Clark, H. H., & Lucy, P. Understanding what is said from what is meant: A study in conversationally conveyed requests. Journal of Verbal Learning and Verbal Behavior, 1975, 14, 56-72.

Collins, A. M., & Loftus, E. F. A spreading-activation theory of semantic processing. Psychological Review, 1975, 82, 407-428.

Collins, A. M., & Quillian, M. R. Retrieval time from semantic memory. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 204-247.

Collins. A. M., & Quillian, M. R. How to make a language user. In E. Tulving and W. Donaldson (Eds.), Organization of memory. New York: Academic Press, 1972.

Embler, W. Metaphor and meaning. Deland, Florida: Everett-Edwards Publishing Co., 1966.

Emig, J. Children and metaphor. Research in the Teaching of English, 1972, 6, 163-175.

Gardner, H. Metaphors and modalities: How children project polar adjectives onto diverse domains. Child Development, 1974, 45, 84-91.

Gentner, D. On the development of metaphoric processing. Child Development, in press.

Gordon, D., & Lakoff, G. Conversational postulates. In P. Cole and J. L. Morgan (Eds.), Syntax and semantics: Speech acts, Vol. 3. New York: Academic Press, 1975.

Green, T. F. The activities of teaching. New York: McGraw-Hill, 1971.

Grice, H. P. Logic and conversation. In P. Cole and J. L. Morgan (Eds.), Syntax and semantics: Speech acts, Vol. 3. New York: Academic Press, 1975.

Grindstaff, F. L., & Muller, A. L. The national assessment of literature: Two reviews. Research in the Teaching of English, 1975, 9, 80-106.

Haynes, F. Metaphor as interactive. Educational Theory, 1975, 25, 272-277.

Horne, N. H. A study of the use of figurative language by sixth grade children (Doctoral dissertation, University of Georgia, 1966). Dissertation Abstracts International, 1966, 28, 3367A.

Katz, J. J., & Fodor, J. A. The structure of a semantic theory. Language, 1963, 39, 170-210.

Khatena, J. Imagery of children and the production of analogy. Gifted Child Quarterly, 1973, 17, 98-102.

Kintsch, W. Structure of semantic memory. In E. Tulving and W. Donaldson (Eds.), Organization of memory. New York: Academic Press, 1972.

Kintsch, W. The representation of meaning in memory. New York: Academic Press, 1974.

Koen, F. An intra-verbal explication of the nature of metaphor. Journal of Verbal Learning and Verbal Behavior, 1965, 4, 129-133.

Kuhn, D. Inducing development experimentally: Comments on a research paradigm. Developmental Psychology, 1974, 10, 590-600.

Levinson, P. J., & Carpenter, R. L. An analysis of analogical reasoning in children. Child Development, 1974, 45, 857-861.

Matter, G. A., & Davis, L. A reply to metaphor and linguistic theory. Quarterly Journal of Speech, 1975, 61, 322-327.

Mayer, R. E. Information processing variables in learning to solve problems. Review of Educational Research, 1975, 45, 525-541. (a)

Mayer, R. E. Different problem solving competencies established in learning computer programming with and without meaningful models. Journal of Educational Psychology, 1975, 67, 725-734. (b)

Millar, R. M. The dubious case for metaphors in educational writing. Educational Theory, 1976, 26, 174-181.

Minsky, M. A framework for representing knowledge. In P. H. Winston (Ed.), The psychology of computer vision. New York: McGraw-Hill, 1975.

Ortony, A. Why metaphors are necessary and not just nice. Educational Theory, 1975, 25, 45-53.

Ortony, A. On the nature and value of metaphor: A reply to my critics. Educational Theory, 1976, 26, 395-398.

Paivio, A. Imagery and verbal processes. New York: Holt, Rinehart & Winston, Inc., 1971.

Perrine, L. Psychological forms of metaphor. College English, 1971, 33, 125-138.

Petrie, H. G. Do you see what I see? The epistemology of interdisciplinary inquiry. Educational Researcher, 1976, 5, 9-15.

Pollio, M. R., & Pollio. H. R. The development of figurative language in children. Journal of Psycholinguistic Research, 1974, 3, 185-201.

Quillian, M. R. Semantic memory. In M. Minsky (Ed.), Semantic information processing. Cambridge, Mass.: MIT Press, 1938.

Reddy, M. J. A semantic approach to metaphor. In Chicago Linguistic Society, Collected Papers, 1969.

Reinsch, N. L. An investigation of the effects of the metaphor and simile in persuasive discourse. Speech Monographs, 1971, 38, 142-145.

Richards, I. A. The philosophy of rhetoric. London: Oxford University Press, 1936.

Royer, J. M., & Cable, G. W. Facilitated learning in connected discourse. Journal of Educational Psychology, 1975, 67, 116-123.

Royer, J. M., & Cable, G. W. Illustrations, anlogies and facilitative transfer of prose learning. Journal of Educational Psychology, 1976, 68, 205-209.

Royer, J. M., & Perkins, M. R. Facilitative transfer in prose learning over an extended time period. Paper presented at AERA, Washington, D.C., 1975.

Rumelhart, D. E., & Ortony, A. The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, and W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, N.J.,: Lawrence Erlbaum Associates, 1977.

Sachs, J. S. Recognition memory for syntactic and semantic aspects of connected discourse. Perception and Psychophysics, 1967, 2, 437-442.

Schaffer, L. F. Children's interpretation of cartoons. In Contributions to education. New York: Teachers College, Columbia University, 1930.

Schank, R. C., & Abelson, R. P. Scripts, plans and knowledge, In Advanced Papers of the Fourther International Joint Conference on Artificial Intelligence. Tbilisi, Georgia: USSR, 1975.

Schweller, K. G., Brewer, W. F., & Dahl, D. A. Memory for illocutionary forces and perlocutionary effects of utterances. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 325-337.

Sharpe, E. Psycho-physical problems revealed in language: An investigation of metaphor. In M. Brierley (Ed.), Collected papers on psychoanalysis. London: Hogarth, 1968.

Shibles, W. A. Metaphor: An annotated bibliography and history. Whitewater, Wis.: The Language Press, 1971.

Shibles, W. A. The metaphorical method. Journal of Aesthetic Education, 1974, 8, 25-36.

Slobin, D. I. Developmental psycholinguistics. In W. O. Dingwale (Ed.), Survey of linguistic science. Baltimore, Md.: University of Maryland, 1971.

Sweet, J. A. An analysis of the rating of elementary children, grades four through six, to determine the relationship between specified genre and the development and use of figurative language (Doctoral dissertation, Indiana University, 1974). Dissertation Abstracts International, 1974, 35, 5697A.

Terry, C. A. A national survey of children's poetry preferences in the fourth, fifth and sixth grades (Doctoral dissertation, Ohio State University, 1972). Dissertation Abstracts International, 1972, 33, 3973A.

Thomson, D. M., & Tulving, E. Associative encoding and retrieval: Weak and strong cues. Journal of Experimental Psychology, 1971, 86, 255-262.

Van Dijk, T. A. Formal semantics of metaphorical discourse. Poetics, 1975, 4, 173-198.

Verbrugge, R. R., & McCarrell, N. S. The role of inference in the comprehension of metaphor. Paper presented at the annual meeting of the Midwest Psychological Association, Chicago, May 1973.

Wheelwright, P. E. Metaphor and reality. Bloomington, Ind.: Indiana University Press, 1962.

Winner, E., Rosensteil, A. K., & Gardner, H. The development of metaphoric understanding. Developmental Psychology, 1976, 12, 289-297.

CENTER FOR THE STUDY OF READING

TECHNICAL REPORTS

No. 1: Halff, H. M. Graphical Evaluation of Hierarchical Clustering Schemes, October 1975.

No. 2: Spiro, R. J. Inferential Reconstruction in Memory for Connected Discourse, October 1975.

No. 3: Goetz, E. T. Sentences in Lists and in Connected Discourse, November 1975.

No. 4: Alessi, S. M., Anderson, T. H., & Biddle, W. B. Hardware and Software Considerations in Computer Based Course Management, November 1975.

No. 5: Schallert, D. L. Improving Memory for Prose: The Relationship Between Depth of Processing and Context, November 1975.

No. 6: Anderson, R. C., Goetz, E. T., Pichert, J. W., & Halff, H. M. Two Faces of the Conceptual Peg Hypothesis, January 1976.

No. 7: Ortony, A. Names, Descriptions, and Pragmatics, February 1976.

No. 8: Mason, J. M. Questioning the Notion of Independent Processing Stages in Reading, February 1976.

No. 9: Siegel, M. A. Teacher Behaviors and Curriculum Packages: Implications for Research and Teacher Education, April 1976.

No. 10: Anderson, R. C., Pichert, J. W., Goetz, E. T., Schallert, D. L., Stevens, K. V., & Trollip, S. R. Instantiation of General Terms, March 1976.

No. 11: Armbruster, B. B. Learning Principles from Prose: A Cognitive Approach Based on Schema Theory, July 1976.

No. 12: Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. Frameworks for Comprehending Discourse, July 1976.

No. 13: Rubin, A. D., Bruce, B. C., & Brown, J. S. A Process-Oriented Language for Describing Aspects of Reading Comprehension, November 1976.

No. 14: Pichert, J. W., & Anderson, R. C. Taking Different Perspectives on a Story, November 1976.

No. 15: Schwartz, R. M. Strategic Processes in Beginning Reading, November 1976.

No. 16: Jenkins, J. R., & Pany, D. Curriculum Biases in Reading Achievement Tests, November 1976.

No. 17: Asher, S. R., Hymel, S., & Wigfield, A. Children's Comprehension of High- and Low-Interest Material and a Comparison of Two Cloze Scoring Methods, November 1976.

No. 18: Brown, A. L., Smiley, S. S., Day, J. D., Townsend, M. A. R., & Lawton, S. C. Intrusion of a Thematic Idea in Children's Comprehension and Retention of Stories, December 1976.

No. 19: Kleiman, G. M. The Prelinguistic Cognitive Basis of Children's Communicative Intentions, February 1977.

No. 20: Kleiman, G. M. The Effect of Previous Context on Reading Individual Words, February 1977.

No. 21: Kane, J. H., & Anderson, R. C. Depth of Processing and Interference Effects in the Learning and Remembering of Sentences, February 1977.

No. 22: Brown, A. L., & Campione, J. C. Memory Strategies in Learning: Training Children to Study Strategically, March 1977.

No. 23: Smiley, S. S., Oakley, D. D., Worthen, D., Campione, J. C., & Brown, A. L. Recall of Thematically Relevant Material by Adolescent Good and Poor Readers as a Function of Written Versus Oral Presentation, March 1977.

No. 24: Anderson, R. C., Spiro, R. J., & Anderson, M. Schemata as Scaffolding for the Representation of Information in Connected Discourse, March 1977.

No. 25: Pany, D., & Jenkins, J. R. Learning Word Meanings: A Comparison of Instructional Procedures and Effects on Measures of Reading Comprehension with Learning Disabled Students, March 1977.

No. 26: Armbruster, B. B., Stevens, R. J., & Rosenshine, B. Analyzing Content Coverage and Emphasis: A Study of Three Curricula and Two Tests, March 1977.

No. 27: Ortony, A., Reynolds, R. E., & Arter, J. A. Metaphor: Theoretical and Empirical Research, March 1977.

No. 28: Ortony, A. Remembering and Understanding Jaberwocky and Small-Talk, March 1977.

sdgj

No. 29: Schallert, D. L., Kleiman, G. M., & Rubin, A. D. Analysis of Differences Between Oral and Written Language, April 1977.

No. 30: Goetz, E. T., & Osborn, J. Procedures for Sampling Texts and Tasks in Kindergarten through Eighth Grade, April 1977.

No. 31: Nash-Webber, B. Anaphora: A Cross-Disciplinary Survey, April 1977.

No. 32: Adams, M. J., & Collins, A. A Schema-Theoretic View of Reading Comprehension, April 1977.

No. 33: Huggins, A. W. F. Syntactic Aspects of Reading Comprehension, April 1977.

No. 34: Bruce, B.C. Plans and Social Actions, April 1977.

No. 35: Rubin, A.D. Comprehension Processes in Oral and Written Language, April 1977.

No. 36: Nash-Webber, B. & Reiter, R. Anaphora and Logical Form: On Formal Meaning Representations for Natural Language, April 1977.

No. 37: Adams, M.J. Failures to Comprehend: A Question of Balance, April 1977.

No. 38: Woods, W.A. Multiple Theory Formation in High-Level Perception, April 1977.

No. 39: Nickerson, R.S. & Adams, M.J. Uses of Context in Speech Understanding and Reading, April 1977.

No. 40: Brown, J.S., & Collins, A. Model-Based Versus Text-Based Reasoning, April 1977.

No. 41: Pichert, J.W., & Anderson, R.C. Recall of Previously Unrecallable Information Following a Shift in Perspective, April 1977.

No. 42: Mason, J., Osborn, J., & Rosenshine, B. A Consideration of Skill Hierarchy Approaches to the Teaching of Reading, April 1977.

No. 43: Collins, A., Brown, A.L., Morgan, J.L., & Brewer, W.F. The Analysis of Reading Tasks and Texts, April 1977.

No. 44: McClure, E. Aspects of Code-Switching in the Discourse of Bilingual Mexican-American Children, April 1977.

No. 45: Schwartz, R.M. Relation of Context Utilization and Orthographic Automaticity in Word Identification, May 1977.